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Labor Support Survey Summary Report

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One of the main cost drivers in the defense aerospace industry is overhead personnel. Traditionally, labor support ratios have been used as an efficiency measure and to control overhead levels. More recently, several organizations have used labor support ratios as a basis for outsourcing and/or downsizing decisions. As a result, the Factory Operations Focus Group attempted to benchmark how member companies stand relative to one another on labor support ratio. This report outlines the survey responses and analysis and summarizes the potential factors influencing labor support ratios. It concludes with a cautionary note in how labor support ratios are used. There are multiple factors which influence labor support ratios, including a particular operation's product-process mix and its manufacturing and workforce. Furthermore, advances in information technology and the redesign of work have obscured the distinction between touch and support jobs.

Survey Design and Administration

Between September 1994 and December 1994, sponsors of the Lean Aircraft Initiative detailed expectations to be gained from the Initiative. One of these expectations was to provide benchmarking information that establishes how member companies perform relative to other member companies and relative to leading companies from other industries. To fulfill this expectation, the Factory Operations Focus Group developed a plan to benchmark member companies during 1995.

In the February 1995 Factory Operations Focus Group Meeting, an interest was expressed in benchmarking the levels of support labor used in member companies. It was thought that this benchmarking effort could be applied across all sectors within the Lean Aircraft Initiative, but the Focus Group desired to collect data only at the manufacturing facility level (or a profit center) to exclude enterprise level activities, such as research and development.

Don Pope of Northrop Grumman proposed a list of functions for which companies could provide estimated or actual worker number information. With this information, MIT prepared a questionnaire to gather information from the LAI membership. The questionnaire was released to all member companies in the Lean Aircraft Initiative in June 1995. Questionnaire responses were sent to MIT for data reduction. Jim Schoonmaker compiled the information and reduced the data. He also conducted follow-up phone interviews with respondents to seek clarification of the data and ask specific questions developed after the initial data reduction.

Survey Response and Analysis

Thirteen operations responded to the survey - seven in airframes, five in electronics/avionics, and one in engines. The type of operation, however, varied greatly from one respondent to another. For example, one respondent provided data for the entire division which included multiple sites, another responded for a major program which again covered multiple sites, while the remainder responded for one site only. In addition, several of the single sites also housed division headquarters, while other were satellite manufacturing plants or repair and overhaul facilities. This made analysis of comparable units extremely difficult. Furthermore, meaningful feedback to the consortium members of the responses would violate confidentiality agreements due to the small sample size.

Nevertheless, we attempted to sort the data by various factors to determine if there were any trends, including:

- sector
- sales
- employees
- number of current programs
- 1994 delivered site units
- cumulative delivered units
- types of manufacturer, e.g., fabrication, assembly, overhaul
- percent commercial
- program phase, e.g., development, full production

Not surprisingly, no trends surfaced due to the small sample of diverse sites. As will be described below, support labor ratios are set by a complex integration of multiple factors and are often unique to company specific situations or strategies.

To truly measure support to touch labor, the ideal metric would be hours spent on each task since many employees often split their time between support and touch work and between various functional support activities. Although the questionnaire asked for equivalent heads (not accounting for vacations or sick time), responses typically reflected current headcount allocations due to the difficulty of collecting the more detailed data.

Factors Influencing Labor Support Ratios

Although many support tasks are valued added, a significant number exist as a result of the need for information brokering between various functions or levels of the hierarchy. The redesign (or re-engineering) of work and the use of information technology have eliminated the need for many of these jobs. Hence, if measured properly, labor support ratios can provide important information relative to trends both internally and, where comparable units are available, externally. But external comparisons must be carefully selected due to the multiple factors which can influence this metric, particularly at the plant level. For purposes of this discussion, the labor support ratio is defined as support labor hours divided by factory touch labor hours. (If dollars are used rather than hours, regional or global differences in salaries and labor rates become a major factor.)

Product Development Stage: Theoretically, labor support ratios should decline as the mix of products mature. However, if a large percentage of the production is toward the end of the product life cycle, the ratio typically increases as production volumes decline. One exception is an overhaul and repair facility which is less affected by the product development stage.

Early in the life of a product, especially prior to pilot production when there is, in essence, little touch labor required, it is natural to have a high ratio. As the product moves into pilot production, there are still relatively few direct labor tasks in comparison with support activities ranging from engineering to program administration, etc. As a product moves to ramp-up and eventually to full production, the ratio should begin to decline rapidly as the primary task becomes manufacturing. Finally as products sunset, volumes decline and ratios increase.

Process Technology Development Cycle: The newness of the process technology being used at a facility will also influence the labor support ratio. If the process technology is new, additional technical support will be needed to install and debug the equipment. This applies to new information systems as well as equipment. For example, if a facility is introducing a new inventory system, parallel systems may need to be in place until the validity of the new system is proven. This will lead to additional support personnel and increase the labor support ratio.

Product/Process Mix: If a facility is producing multiple and/or complex parts, the coordination of materials and production scheduling will increase the number of indirect support personnel needed. Hence, one would expect a higher labor support ratio. The type of manufacturing process at the plant will also greatly influence its labor support ratio. If the operation is capital intensive rather than labor intensive, there will be fewer direct labor personnel and a greater need for equipment maintenance support people. In contrast, in a labor intensive assembly operation, there will be more direct labor personnel to lower the ratio.

Production Volumes: Based on “economies of scale,” more cumulative units produced should move an organization down the learning curve. Hence, if all other factors are held constant, higher volumes should lower labor support ratios. This is closely related to the product life cycle and the product-process mix, but identified separately because it is possible to have

two operations with similar process technology producing similar products, but at different volumes.

These trends concerning the interaction of the product development cycle, process technology, and production volumes were first identified as the dynamics of the product-process life cycle by Robert Hayes and Steven Wheelwright in 1979. Using their product-process matrix, one could predict an operation’s labor support ratio as shown in Exhibit 1. As an operation moves from the upper left-hand corner to the lower right-hand box, the labor support ratio is predicted to decline.

Exhibit 1: Product Process Matrix

	Product structure			
	Product life cycle stage			
Process structure Process life cycle stage	low volume, one of a kind	multiple products, low volume	few major products, higher volume	high volume, commodity products
Job shop	<i>high support labor ratio</i>			
Disconnected line flow (batch)				
Connected line flow (assembly line)				
Continuous flow				<i>low support labor ratio</i>

Business Mix: The mix of commercial versus military production at a facility may also influence the amount of indirect support needed to comply with acquisition requirements and oversight interfaces. This is based on the assumption that commercial practices will reduce labor support ratios.

Sourcing Strategy - A decision to outsource component parts may have an adverse impact on labor support ratios since the number of in-house touch labor hours will reduce while the support tasks involved with supplier coordination, e.g., purchasing, supplier quality and receiving, will increase. Conversely, a decision to outsource support tasks will decrease the labor support ratio.

Site Support: The overall plant network strategy will influence the level of indirect support at a facility. For example, a satellite operation may be staffed primarily with production personnel with very little on-site support, i.e., support is provided by a “mother plant.” Modern conveniences, such as electronic mail and telephone/video conferences, have reduced the need to have on-site support in many cases. Where this is the case, the satellite facility would have a very low labor support ratio while the ratio at the “mother plant” would be inflated to provide support to its satellites.

Work Design: Through the redesign of work, many support tasks can be eliminated or incorporated into the on-going responsibilities of touch personnel. For example, a machinist might assume some support tasks during the machine cycle rather than standing idle. In this case, that time is legitimately classified as direct labor time, but it is being used to accomplish both touch and support work.

Headcount Management: How jobs are accounted for also affects the ratios. Ideally, the ratio should reflect actual support to touch work rather than direct to indirect heads. The former is extremely difficult to track, which makes comparisons across companies questionable. (The introduction of ABC management systems has the potential to rectify this discrepancy.) Furthermore, under the current accounting and human resource tracking systems, there are numerous opportunities to “game” the ratio, e.g., how work is assigned to individual employees. In addition, the use of contract or temporary employees may not be tracked the same as full-time employees.

Conclusions

Based on the preceding discussion, and due to the sample of responses to the survey, it is difficult to draw any firm conclusions from the labor support survey other than to raise the flag of caution when using labor support ratios. It is all too easy to superficially compare ratios without recognizing the disparities in making such comparisons. In order to provide relevant benchmark data, we would have had to have had a much larger sample which included a sufficient number of sites to differentiate between all the factors noted earlier. Labor support ratios, however, can be a useful metric to track trends within an operation when properly measured, i.e., hours as opposed to headcount. The ratio can also be a relevant benchmark when comparable units are available, or when the ratio is used at a business level where there are typically a mix of products and processes.

As work is re-engineered or as manufacturing facilities are redesigned into high performance organizations, labor support ratios are becoming less meaningful since the distinction between touch and support labor is blurred. This is particularly true when the metric is measuring headcount as opposed to labor hours. The traditional lines of demarcation between touch and support personnel are artificial barriers to creating a lean, flexible workforce.